

# On the Previously Undescribed Aggregate Form of the Pelagic Tunicate *Ritteriella picteti* (Apstein) (1904)<sup>1</sup>

LEO D. BERNER<sup>2</sup>

DURING MARCH, APRIL, AND MAY, 1949, over 400 specimens of *Ritteriella picteti* were taken off the west coast of the United States and Baja California in the net hauls taken by the Scripps Institution of Oceanography in conjunction with the California Co-operative Research Program. This is its first reported occurrence in the eastern Pacific Ocean and in large numbers. In this material the solitary form and the undescribed aggregate form are both represented. The original recognition of the aggregate form was based on specimens that contained embryos of the solitary form which were mature enough to possess their characteristic diagnostic features. Five individuals of the aggregate generation have been deposited in the United States National Museum, under number 11170.

I wish to express my appreciation to Dr. Martin Johnson for his valuable assistance in the preparation of this manuscript.

In the past *Ritteriella picteti* has been considered a rare species by all workers on the Thaliacea. Apstein (1904: 655) described the species from a single specimen taken off Amboina, Dutch East Indies. He again found the species in the Tiefsee Expedition material (1906a: 252), listing two specimens, but appears to have confused it with *R. amboinensis*, so the number may be higher. From the Deutsche-Südpolar Expedition, Apstein (1906b: 168) reported three specimens of *R. picteti*. Ritter (1906: 1-5) took one specimen from Sugura Bay, Japan, which he described as a new species, *Cyclosalpa retracta*. Ihle (1910: 43-46) reported two specimens from the Siboga collections, and Sewell (1926) reported

two specimens from the Indian Ocean collections he examined. Komai (1932: 64-69) and Thompson (1948: 124-126) each reported one specimen from their collections. Thus more than 13 specimens, all of the solitary form, were reported in nearly 50 years of investigation. Thompson (1948: 125) suggested that he may have found the aggregate form of the species, but from his description it appears that he must have been looking at a very young individual or at another species.

## *Ritteriella picteti* (Apstein) (1904)

*Cyclosalpa retracta* Ritter, 1906

*Salpa amboinensis* Apstein, 1906a

[non] *S. amboinensis* Apstein, 1904

*Salpa picteti* Apstein, 1906a

*Salpa picteti* Apstein, 1906b

*Salpa retracta* Ihle, 1910

*Salpa picteti* Ihle, 1910

*Salpa picteti* Ihle, 1912

*Salpa* (*Ritteria*) *picteti* Metcalf, 1918

*Salpa* (*Ritteria*) *retracta* Metcalf, 1918

*Salpa* (*Ritteriella*) *picteti* Metcalf, 1919

*Salpa* (*Ritteriella*) *retracta* Metcalf, 1919

*Salpa* (*Ritteria*) *picteti* Sewell, 1926.

*Salpa* (*Ritteriella*) *picteti* Komai, 1932.

*Ritteriella picteti* Ihle, 1935

*Ritteriella picteti* Thompson, 1948

## DESCRIPTION OF AGGREGATE FORM

*Body:* (Fig. 1) The body is ovoid, with anterior and posterior processes which are usually short. In dorsal view *R. picteti* is quite similar in appearance to *R. amboinensis*, *Salpa maxima*, and *S. fusiformis*. The atrial opening is dorsally placed. The test is soft, often collecting debris from the sample, thus making the details of the animals difficult to see. The mature specimens examined have ranged in size from 9 to 35 millimeters, excluding the processes.

<sup>1</sup> Contribution from Scripps Institution of Oceanography New Series No. 686. Manuscript received June 12, 1953.

<sup>2</sup> Scripps Institution of Oceanography, University of California, La Jolla, California.

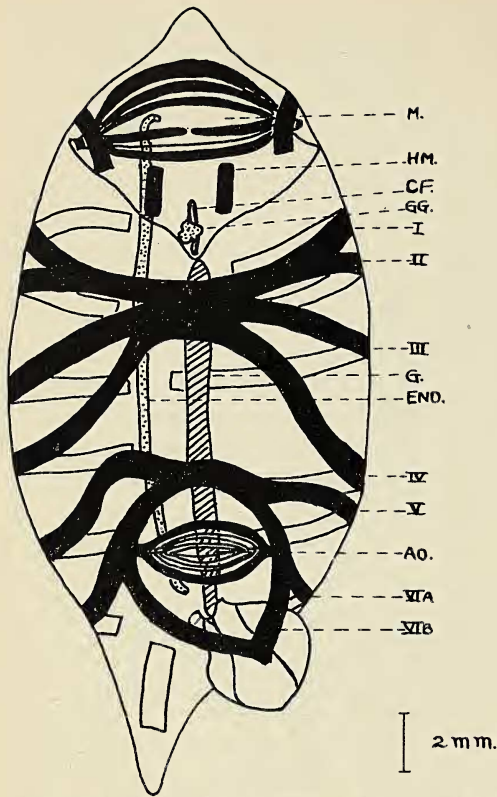


FIG. 1. *Ritteriella picteti*, aggregate form. AO, atrial opening; CF, dorsal tubercle; END, endostyle; G, gill; GG, ganglion; HM, dorsal horizontal muscle; M, mouth; I-VI, body muscles.

**Muscles:** The body muscles (Figs. 1, 2) may be asymmetrically arranged. There are usually six body muscles on each side of the animal although specimens have been found with seven on one side (Fig. 2). Body muscles I and II are joined over the dorsal half of their course, separating laterally, whereas III and IV are joined dorsally over a short portion of their course and contact the bundle formed by muscles I and II in the same general area. Muscles V and VI are also in contact over the dorsal portion of their course. Laterally, muscles IV and V may approach closely. Muscle VI has an anterior branch in front of the gut and a posterior branch which joins its mate from the opposite side over the gut nucleus. There is a broad, independent muscle running along the base of the posterior process. The atrial muscles resemble those of *R. amboinensis*.

There are four delicate sphincters attached laterally to a delicate retractor muscle. This muscle then attaches to a heavier retractor which receives the attachment of the heavy basal sphincter. The retractor finally attaches to muscle VI just before the sixth muscle divides. The oral musculature (Fig. 3) includes a single oral retractor laterally on each side and three sphincters on both the upper and lower lips. The sphincters of the upper lip include a wide muscle which is discontinuous medially,  $U_1$ , a narrow muscle,  $U_2$ , and a wide muscle,  $U_3$ . The sphincters of the

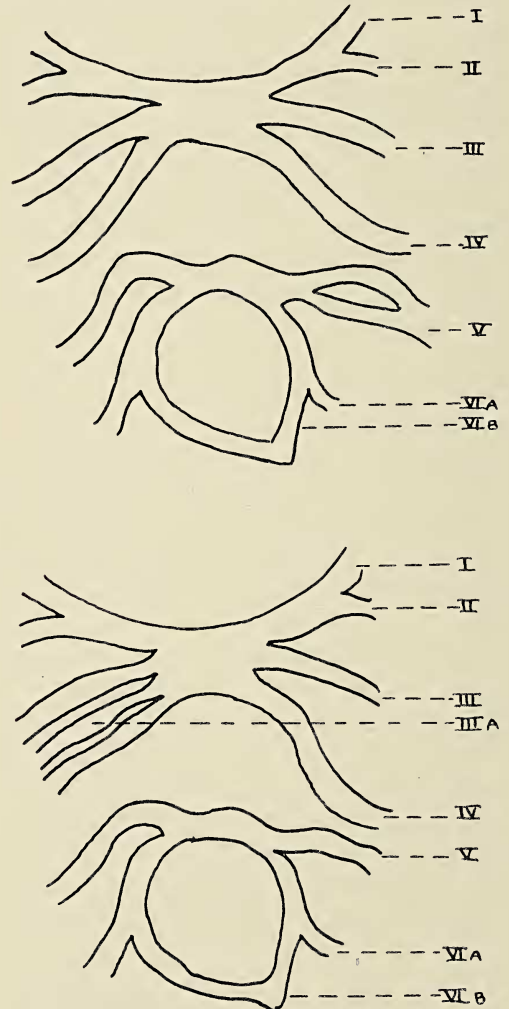


FIG. 2. Diagrammatic representation of some variations found in the arrangement of body muscles of *Ritteriella picteti*, aggregate form: I-VI, body muscles.



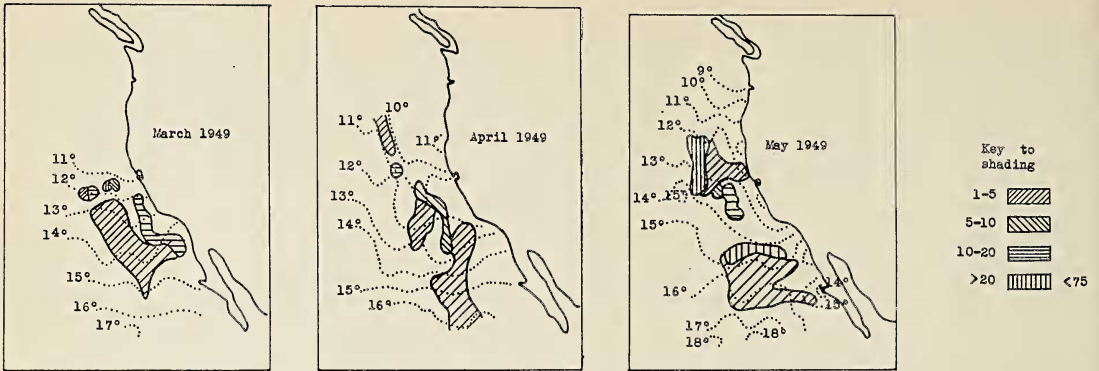


FIG. 4. Charts showing the distribution and approximate numbers of *Ritteriella picteti*, per 1,000 cubic meters of water filtered. Isotherms in degrees centigrade.

is no problem, but in specimens in which the muscles are not easily seen separation of the species is complicated. The best solution to the problem yet found is staining the muscles. For the purpose of this "identification staining," Rose Bengal has been found very useful although not suitable for permanent preparations. A stock solution of 0.1 per cent Rose Bengal may be added to a mixture of sea water and formalin in various amounts to give the intensity of staining desired, with no salt reaction. The main objection to the method is that the stain washes out very easily.

The distribution of *R. picteti* during the period covered by this paper is shown in Figure 4; it can be seen that the occurrence of the species is variable. The patchiness seen is typical of distributions of "salps" and especially true of those which do not occur in large numbers and are not extremely common. This form appears to be much more tolerant of cold water than its relative *R. amboinensis*. It has been taken in water with a temperature as low as 10 degrees at a depth of 10 meters. In the area examined, the lower limit of their range appears to be in the vicinity of this 10-degree isotherm.

#### REFERENCES

- APSTEIN, CARL. 1904. Salpes d'Amboine. *Rev. Suisse de Zool.* 12(3): 649-656.  
 ———. 1906a. Salpen der Deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutsche Tiefsee-Expedition* 12(3): 245-290.

- . 1906b. Die Salpen der Deutschen Südpolar-Expedition 1901-1903. *Deutsche Südpolar-Expedition* 9(3): 155-203.  
 IHLE, J. E. W. 1910. Die Thaliaceen (einschliesslich pyrosomen) der Siboga Expedition. *Siboga Exped.* 49(1): 1-55.  
 ———. 1912. Tunicata, Salpae I, Desmomyaria. In *Das Tierreich* [Ed. F. E. Schulze] Lief. 32. xi+66 pp. R. Friedländer und Sohn, Berlin.  
 ———. 1935. Desmomyaria. In *Handbuch der Zoologie* [Ed. Kükenthal und Krumbach]. Vol. 5(2, 5), pp. 401-544. Walter de Gruyter & Co., Berlin und Leipzig.  
 KOMAI, TAKU. 1932. On some salps occurring in the vicinity of Seto, with remarks on the enatiomorphism found in some aggregate forms. *Kyoto Univ., Col. Sci., Mem.* 8(1) series B: 65-80.  
 METCALF, MAYNARD M. 1918. Contributions to the biology of the Philippine Archipelago and its adjacent regions. *U. S. Natl. Mus., Bul.* 100(2) 2: 1-193.  
 ———. 1919. Corrections to Metcalf 1918. *Science* 50(1279): 19-20.  
 RITTER, W. E. 1906. *Cyclosalpa retracta*, a new salpoid from the coast of Japan. *Annot. Zool. Jap.* 6(1): 1-5.  
 SEWELL, R. B. SEYMOUR. 1926. The salps of Indian seas. *Indian Mus., Rec.* 28(2): 65-126.  
 THOMPSON, HAROLD. 1948. *Pelagic tunicates of Australia*. 195 pp. Commonwealth Council for Scientific and Industrial Research [Australia], Melbourne.